

TOTAL KNEE ARTHROPLASTY IN THE YOUNG RHEUMATOID PATIENT

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Thirty-four total knee arthroplasties were performed for severe rheumatoid arthritis in 25 patients younger than 45 years. All patients were available for follow-up evaluation at an average of 7.2 years. According to the Knee Society scoring system, the knee score improved from an average of 21 points preoperatively to 85 points at follow-up ($p < 0.001$). The average functional score improved from 23 points to 87 points ($p < 0.001$). Average range of motion improved from 71° to 93° ($p < 0.001$). Nonprogressive radiolucencies less than 1-mm thick were observed in 6 knees. One knee was revised for severe polyethylene wear ; another case was revised for chronic patellar dislocation. Actuarial survivorship analysis estimates a 97% survivorship after 5 years and 90% after after 10 years. In young rheumatoid patients, total knee arthroplasty can therefore be considered as a reliable procedure, with satisfactory results during at least the first 5 to 10 postoperative years.

Key words : total knee arthroplasty ; rheumatoid arthritis ; young patients.

Mots clés : prothèse de genou ; arthrite rhumatoïde ; sujets jeunes.

INTRODUCTION

Total knee replacement in rheumatoid arthritis patients with advanced knee joint involvement is a very reliable procedure for the relief of pain and restoration of function. In the young patient however there is some concern about the durability of the arthroplasty. The aim of this study was to evaluate the long-term results of total knee arthroplasty, using current condylar designs, in patients with rheumatoid arthritis who were less than 45 years old.

MATERIALS AND METHODS

Between 1981 and 1992 a primary total knee arthroplasty was performed in 1431 knees in our department. Of these, 34 (2%) were performed for severe rheumatoid arthritis, in 25 patients younger than 45 years. The average age at operation was 39 years. Nineteen of the patients were female ; 6 were male. Nine patients fulfilled the criteria of the American Rheumatism Association for juvenile rheumatoid arthritis (12). A total condylar-type prosthesis was used in all cases : an uncemented P. C. A. prosthesis in 14, a Total Condylar in 7, an Insall Burstein in 5, and a posterior stabilized Genesis prosthesis in 8 cases, reflecting the surgeon's preference and the availability of a type of prosthesis at the time of surgery. All patients were available for follow-up evaluation at an average of 7.2 years (range 3 to 13 years) postoperatively.

A clinical score was calculated according to the Knee Society scoring system (6.). This system assigns 100 points for the knee result and 100 points for the functional result. The pre- and postoperative scores were compared using a paired Student t-test.

The Knee Society Total Knee Arthroplasty Roentgenographic Evaluation and Scoring System was used to evaluate the roentgenograms (3). This

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system has a numerical score for the prosthesis interfaces that assesses the quality of fixation by measuring the width of any radiolucent lines.

Eleven patients had a previous osmium synovectomy at an average of 5 years before the arthroplasty.

Three patients had an open and 2 an arthroscopic synovectomy, respectively 3 and 2 years on average before the arthroplasty.

RESULTS

The mean preoperative knee score was 21 points (range 0-51 points). The mean knee score at follow-up evaluation was 85 points (range 15 to 99 points) ($p < 0.001$). The pain relief was dramatic. In all 34 cases the patients had severe preoperative pain; postoperatively 26 had no pain, 7 had mild or occasional pain and 1 had continuous moderate pain.

The mean preoperative flexion was 83° (range 40° to 120°). The mean flexion at follow-up was 98° (range 70° to 120°) ($p < 0.001$; paired Student t-test). Thirty-one of the 34 knees had improved flexion. The remaining knees lost 10° (one knee) or 5° (two knees) of flexion postoperatively (table I).

Table I. — Motion

Range of motion	Preoperative	Follow-up
Flexion	83° (40° - 120°)	98° (70° - 120°)
Arc of motion	71° (35° - 120°)	93° (50° - 120°)
Flexion contracture	12° (5° - 40°)	5° (0° - 20°)

The mean preoperative arc of motion was 71° (range 35° to 120°). The mean arc at follow-up was 93° (range 50° to 120°) ($p < 0.001$). The arc of motion increased in all but one patient, in whom it decreased 10° .

The mean preoperative flexion contracture was 12° . Seventeen knees had a preoperative flexion contracture of 5° to 40° . The mean flexion contracture at follow-up evaluation was 4.70° ($p < 0.001$; paired Student t-test). Nine knees had a residual flexion contracture of 5° to 20° . No knees had an increased flexion contracture post-

operatively, but two knees without a preoperative flexion contracture developed one (5°) postoperatively.

The mean preoperative functional score was 23 points (range, 0 to 50). The mean functional score at follow-up evaluation was 87 points (range, 15 to 100) ($p < 0.001$; paired Student t-test). Only one patient had a functional score of less than 60 points at follow-up evaluation.

The mean preoperative AP roentgenographic knee alignment was 7.4° valgus (mechanical angle) (range 50° valgus to 6° varus). The mean alignment at follow-up was 0.4° valgus (range 5° valgus to 3° varus). Radiolucent lines developed in 6 knees postoperatively, all 1-mm thick under the tibial component (one in zone 2 (AP view), two in zones 3 and 4 (AP view)), one in zone 1 (lateral view) and two in zones 1 and 2 (lateral view). In all these cases the lucencies were seen within one year of surgery and did not show any progression at later follow-up.

Anterior subsidence was seen in one case with an uncemented PCA prosthesis, without clinical repercussions at 5 years follow-up (knee score 83, functional score 80). No cases of subsidence were noted with posterior stabilized components.

None of the patients with a posterior cruciate retaining knee arthroplasty showed increased posterior laxity at clinical examination, or posterior sagging on lateral x-ray follow-up.

No significant differences between posterior cruciate retaining and posterior stabilized components were noted concerning average mobility, knee score, functional score and the presence of radiolucent lines at latest follow-up ($p < 0.1$, Student t- and Fisher exact tests).

Two prostheses were revised. A PCA prosthesis was revised 6 years, 2 months postoperatively because of severe pain and synovitis due to polyethylene failure. During revision, complete posteromedial and posterolateral tibial polyethylene wear with metal-on-metal contact was noted. All components were revised by a constrained condylar-type implant (Genesis constrained knee). A Total Condylar prosthesis was revised into a hinge-type prosthesis 3 years, 7 months postoperatively because of chronic patellar dislocation,

with a secondary progressive valgus deformation due to elongation of the medial ligaments.

An actuarial survivorship analysis (Cutler-Ederer) (2) was calculated with the endpoint defined as revision of the arthroplasty, or a moderate or severe pain sensation, or a knee score or functional score less than 70 points (table II). The endpoint was not achieved in any of the cases except in the two revised knees.

Table II. — Actuarial survival analysis (Cutler-Ederer)

Year since operation	n_i	d_i	w_i	$q_i = \frac{d_i}{n_i - w_i/2}$	P_i	s_i	$1.96 \times SE$
0-1	34	0	0		1	1	0
1-2	34	0	0	0	1	1	0
2-3	34	0	0	0	1	1	0
3-4	34	1	8	0.03	0.97	0.97	0.064
4-5	25	0	5	0	1	0.97	0.064
5-6	20	0	3	0	1	0.97	0.064
6-7	17	1	3	0.06	0.94	0.90	0.176
7-8	13	0	2	0	1	0.90	0.176
8-9	11	0	5	0	1	0.90	0.176
9-10	6	0	0	0	1	0.90	0.176
10-11	6	0	0	0	1	0.90	0.176
11-12	3	0	2	0	1	0.90	0.176

n_i : number of patients at the beginning of the interval

d_i : number of patients achieving the endpoint

w_i : number of patients at final follow-up

q_i : failure rate per interval

P_i : success rate per interval

s_i : cumulative success rate

SE : standard error (Greenwood)

The calculated cumulative probability of survival after 5 years was 97% with a 95% confidence interval of plus or minus 6.48% (Greenwood) (5), and 90% after 10 years with a 95% confidence interval of plus and minus 17.6% (fig.1).

DISCUSSION

When comparing rheumatoid knee joints to knee joints with primary osteoarthritis or post-traumatic arthritis the most striking factor is its environment : the rheumatoid person. The rheumatoid knee joint is only a small part of a systemic problem, severely restricting the patient's activity level. Although a low activity level is probably

Cumulative success rate

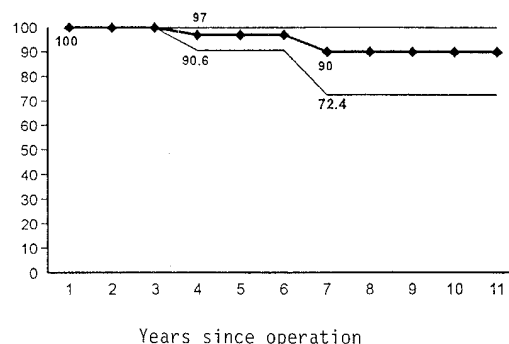


Fig. 1. — Actuarial survival analysis (Cutler-Ederer) with 95% confidence intervals.

advantageous with regard to the survivorship of a patient's knee arthroplasty, it leads to osteopenia and muscular weakness. Persistent synovitis, cruciate ligament attenuation, metaphyseal granulomas and bone defects, excessive valgus deviation with secondary capsuloligamentous alterations, and the long-term use of steroids are all other factors that jeopardize a successful outcome.

While these considerations are true for the older rheumatoid patients, they even have a greater impact on the decision to perform a total knee arthroplasty in younger rheumatoids.

The results of total knee replacement in young adults who have rheumatoid arthritis have been reported by several authors (1, 4, 7, 8, 10, 11, 13-15). Sarokhan and Stuart reported to our knowledge the two largest series of respectively 48 and 44 cemented knee arthroplasties with an average follow-up of 5 years. In both studies dramatic pain relief was reported together with a marked improvement in knee function. Radiographic analysis revealed radiolucent lines in respectively 18% and 30% of the cases, however without apparent clinical repercussion. In both series no problems of loosening were encountered and no prostheses needed revision.

This study presents another 34 cases with an average follow-up of 7.2 years. All our patients were treated with a total condylar-type prosthesis, and this resulted in significant pain relief, an important improvement in knee score and functional score, except for 2 cases in which a revision was required — one for massive polyethylene wear

due to prosthesis design and polyethylene quality, and one for chronic patellar dislocation.

It can be discussed whether the routine use of posterior-stabilized components is preferable in this patient group. This study did not show any benefit for posterior-stabilized or cruciate-retaining prostheses concerning range of motion, knee score or functional score. The theoretical concern of inevitable posterior cruciate ligament attenuation in a rheumatoid population, with the possibility of increasing posterior laxity over time, could not be demonstrated in this study by clinical testing and comparative x-ray analysis. Instrumented posterior laxity measurements however were not performed.

Two cases were revised into a more constrained-type arthroplasty, the first into a CCK-type knee and the second into a hinge-type knee. Today we would no longer recommend the use of uniaxial hinge-type systems, but would suggest the use of the minimal constraint necessary to provide a stable joint. We feel nowadays that a CCK device is therefore sufficient most of the time, except in cases with major collateral ligament damage. When this is the case, the use of a rotating-hinge device may be indicated, although this might lead to loosening in the longer term, owing to the generation of high interface stresses.

In this patient group actuarial survivorship analysis showed a cumulative probability of success of 97% after 5 years, and 90% after 10 years; however the confidence intervals are broad (respectively plus and minus 6.4% and 17.6%) owing to the relatively small number of patients, and this warrants some reservation especially on the estimated 10-year survivorship.

We therefore conclude that in young rheumatoid patients, total knee arthroplasty can be considered as successful as in older rheumatoid or osteoarthritic patients concerning pain relief, knee score and functional score, for at least the first 5 to 10 postoperative years.

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SAMENVATTING

J. BELLEMANS, J. VICTOR, R. WESTHOVENS, J. DEQUEKER en G. FABRY. Totale kniearthroplastie in de jonge reumapatiënt.

In een retrospectieve studie werd het resultaat nagegaan van 34 totale knieprothesen bij ernstige reumatoïde artritis patiënten jonger dan 45 jaar. Alle patiënten waren beschikbaar voor follow-up evaluatie, gemiddeld 7,2 jaar postoperatief. Volgens de internationale Knee

Society Scoring verbeterde de kniescore significant van 21 punten preoperatief tot 85 punten tijdens de laatste follow-up. De functionele score verbeterde van gemiddeld 23 punten tot 87 punten. De bewegingsarcus verbeterde van 71° preoperatief tot 93° postoperatief. Niet progressieve radioluenties, < 1 mm, werden waargenomen in 6 gevallen. Er waren 2 revisies: 1 voor ernstige polyethyleenslijtage, en een andere voor chronische patellaluxatie. Actuariële survivorship analyse toonde een 97% survival na 5 jaar en 90% na 10 jaar. De auteurs besluiten dat een totale knieprothese bij jonge reumapatiënten een betrouwbare en duurzame oplossing is, althans gedurende de eerste 5 tot 10 jaar.

RÉSUMÉ

J. BELLEMANS, J. VICTOR, R. WESTHOVENS, J. DEQUEKER et G. FABRY. Prothèse totale de genou dans l'arthrite rhumatoïde chez l'adulte jeune.

Les auteurs rapportent 34 cas de prothèse totale de genou placée chez des patients âgés de moins de 45 ans pour arthrite rhumatoïde. Sur la base du «Knee Society Scoring system» le score du genou est passé de 21 points en pré-opératoire à 85 points en post-opératoire. Le score fonctionnel est passé de 23 points à 87 points. La mobilité a progressé de 71° à 93°. Un liseré radiologique minime de moins d'un millimètre se remarque chez 6 malades.

Deux prothèses ont été reprises, l'une pour usure du polyéthylène, et l'autre pour une luxation habituelle de la rotule.

L'étude de la survie actuarielle indique une survie de 97% après 5 ans et 90% après 10 ans.